

New Analysis and Theory of Deployable Folded Structures, Phase II

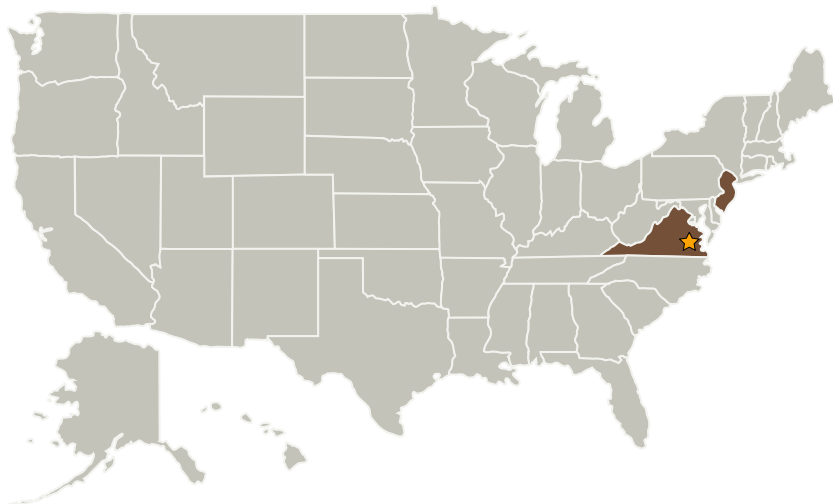
Completed Technology Project (2006 - 2008)



Project Introduction

A recently developed mathematical folding theory has great value for deployable space structures and in situ manufacture of large beams, panels and cylinders. The new technology offers diverse capacity to design, manufacture, and self-assemble periodically folded sheet material. The range of materials includes many customized core materials for laminated panels, cellular habitat walls, structural beams, parabolic reflectors, and efficient truss systems that can be packaged ideally as a roll of sheet material and deployed in space by inflation or passive radiation. The algebraic linkage conditions on the deployment of a folded structure forms an over-constrained system of equations. The deployment kinetics are only possible due to engineered relationships between the neighboring facet geometry, and globally requires a uniform angular change in fold extension across the pattern. This implies that fixing an individual fold angle fixes all of the fold angles in its neighboring region. If the fold angles are all made rigid, then the entire structure is highly over-constrained and forms a very robust truss system. The goal is to introduce the technology by demonstrating the diversity of folding architectures that can be directly applied to deployable space structures, and by developing the associated design and simulation software to transfer this know-how to the engineering community.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Langley Research Center(LaRC)	Lead Organization	NASA Center	Hampton, Virginia
Folded Structures Company, LLC	Supporting Organization	Industry	Ringoes, New Jersey

Primary U.S. Work Locations

New Jersey	Virginia
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Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.3 Mechanical Systems
 - └ TX12.3.1 Deployables, Docking, and Interfaces